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ABSTRACT

The Internet creates a unique opportunity for building virtual professional communities. The Lamda Community Project was created to use the Internet to support science and technology education as part of the Israeli national program to advance science and technology education in Israel. A virtual community was created as a meeting place and resource sharing forum for participants, and participants were given suggestions on the types of activity that could take place in the virtual community. The project investigated user-network interaction, site design, authoring of content on the Internet, the building of sub-communities, and project-based learning. Observations about leadership in virtual communities include: (1) leaders can learn new things quickly and are not afraid to request resources from the team; (2) leaders appear in various ways--they contribute to mailing lists, organize new centers, and bring in new members; (3) there are two types of leaders--those who want to advance themselves, and those who want to advance the community; (4) new teachers are more able to advance themselves than veteran teachers; (5) some leaders lack basic skills of organization and management; (6) short-term leaders are easier to find than long-term leaders; (7) leadership takes time--teachers are often prevented from becoming leaders because of time constraints; (8) leadership of content is relatively easy compared to leadership of processes; (9) virtual communities facilitate leadership for some, but inhibit leadership for others; and (10) leadership in a virtual community calls for a different mix of leadership qualities. (Contains 10 references.) (Author/SWC)

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Patterns of Leadership in Virtual Professional Communities: The Case of 250 Israeli Science and Technology Educators

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Background

The field of Computer Mediated Communication (CMC)

Since the 1970s CMC have been used sporadically in education (Harasim, 1989; Rice 1992). Concepts like remote learning, copyrights control, lurking, MUDing (Multi User Dungeon), and other CMC terminology have appeared in the literature. While Rice (1992) says that "there is little theoretical or empirical research in this area" he, with others, published a few hundred papers about CMC.

Such pre-1995 research dealt mostly with text-based systems that were used by computer users. The "texiti-ness" and the "computer-ness" of CMC have changed dramatically with the emergence of the internet. As of 1996, even novice users can use CMC with relatively easy-to-use Graphical User Interfaces (GUIs).

Three factors have led to the demise of "texiti-ness" and "computer-ness" of CMC.

- Factor 1 - The deployment of the Point to Point Protocol (PPP) (PPP FAQ, 1996) which enable personal computers, often at the homes of users, to be linked as equal members to the net. This equality means that my home PC is equal to an IBM main frame when it comes to the internet. Sure, the IBM may deal with more mail, and serves more files, but my own "little" computer can send and receive mail, send and receive files (e.g., FTP), and even be accessed from anywhere (e.g., Telnet).
- Factor 2 - The development of the World Wide Web (WWW) which allows the publication of multi-media content. With any commonly avaiable text editor one could write

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documents that would look almost the same by various browsers all over the world. With a little more effort one could add pictures, create links, and even deal with sounds and loading of files. The web became an easy way to publish content and a universal way to read content (with the dissemination of free or almost free browsers).

- Factor 3 - A new improved cost/speed ratio of modems. In early 1996 the cost of 14.4 modems dropped below the $100 line. Currently (December, 1996) the cost of 28.8 baud modems became so marginal that many PC makers are embedding the modem board as part of the basic computer.

The combination of these three factors created the initial boom of the internet, a boom that has changed the field of CMC. Let me therefore humbly argue that the value of pre-1995 research mostly stemmed from suggesting concepts and issues. Yet now we must take a fresh look at the relations between these concepts and the real world. CMC terms like, remote learning, copyrights control, lurking takes a different meaning when 75 million internet users are involved.

The Lamda Community Project

The new networking technologies or the "internet" as they are globally known, create a unique opportunity for building virtual professional communities. The uniqueness of the internet stems from its social component. It is the first time we have a global many-to-many technology that facilitates media of all sorts (not just audio as in the telephone).

The Lamda community project was created to "use the internet to support science and technology education" as part of the Israeli national program to "advance science and technology education in Israel. ("Tomorrow 98" or in its Hebrew name "MAHAR 98"). The funding was channeled through the Science and Technology Education Center which is located in the Tel Aviv University School of Education.

The research questions of the project revolve around the nature of professional virtual communities. More specifically we are looking at user-network interaction, site design, authoring of content on the net, the building of sub-communities, and project based learning. The issue of leadership, as this paper will show, emerged as one of the critical issues during the last year of operation.

During the first year, 1994, we conducted a general overview of network technologies, and their potential educational use both in Israel and in the world. This initial examination

revealed what we then called "a messy situation." It appeared that beyond the usual challenges of "large scale changes in K-12 education" (Sivan, 1995) educational research and practice lacked a clear understanding regarding the role of CMC in such a change.

Figure 1. The Lamda Community Site (www.lamda.org.il)

In the second year, 1995, the first 50 members of the community joined-in and the first web site was created. The initial design of initiating members and site building was constructed (See Figure 1.).

Once we developed the basic graphical language of houses, roads, tours, etc. we had to develop few iconic means to represent various aspects of the community. The city metaphor gives us a wealth of such means (i.e., special zones, the Junk Yard). Table 1. includes the main centers in the site. (For a complete description of the various centers see Lamda English Site Tour, 1995).

Table 1. Main centers in the Lamda community site.

Num. & Location *		Area or Center Name	Description
1	H1	Israel-WWW Road Sign	Leading to National and International Sites.
2	G1	Internet Tour	An explanatory description of the Internet.

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Num. & Location *		Area or Center Name	Description
3	E2	Content	A list of all informational pages and services in the site.
4	D2	Site Tour	A general description of all main centers in Lamda community Site. Accessible to non-members.
5	C1	Science Square	In this area, dedicated centers for Science-Education activities will be built. The brown area represents areas under construction.
6	C1	Learning Experiences	A collection of scientific learning experiences.
7	D1	Thinking Toolkit	A collection of pedagogic tools for teachers, to be used in class or at home.
8	B4	Discussorium	A center for holding discussion forums on a variety of subjects. Similar in concept to the Internet News.
9	D3	FAQ (Frequently Asked Questions)	Contains answers for users' questions.
10	A2	Enterprise Zone	A center containing member originated activities (successful activities will move out to somewhere in the site. Failed activities will find their way to the Junk Yard G2).
11	E3	Lamda News	A center containing news about the Lamda site, the Internet etc. Updated weekly.
12	F3	Users Center	A center containing a directory and home pages of all community members.
13	H4 G3	Founders and Foundation	An informational area containing description of the main founders and foundations of the community.

* Note: location can be found using the grid in the map (Figure 1)

1996 became the year of initial deployment. On the one hand steady growth in membership and on the other hand a steady build-up of the Lamda community Site. Today (December 1996) we have about 200 members and 9000 pages in our site. Among other things the Lamda site includes a dual-mail-web discussion center; a weekly news; an automatic front page; an automatic translation of MS-word files to web mini-sites (for project based learning); general feedback mechanism; and, of course, various content centers in the area of science and technology education.

Lamda Community as a Test Case for Virtual Professional Communities

The Lamda community was designed as a "self-evolving system." As such system, we try to foster an iterative interactive process among three factors: the members, the material on the Lamda community site, and the technological systems supporting the community.

This iterative interactive process is similar to the process of establishing a new city whereby there is interaction among the residents of the city, the physical structure (streets, zones etc.) and the various systems in charge of constructing the city (road contractors etc.) Unlike cities, which basically have a regular structure, there is no standard or known structure for virtual communities.

Our initial research on virtual communities (which was based mostly on typical internet communities) identified four major dimensions of the relations between the community and its members (see Tables 2 and 3). In all four we have decided to veer from the typical internet mode and to select a somewhat different approach (to be later called a "market-driven" approach.

Table 2: What the Community demands from members

Dimensions:	**What typical internet communities demand from members:**	**What the Lamda community demands from members:**
Who can join?	Members can freely join in. The "freeness" of the net means free access to information (i.e., web sites) and free participation (mailing lists and news groups).	The community is closed to non-members. To become a member one needs to submit a resume and be interviewed over the phone.
Does it cost money?	Free not only in terms of access but also in terms of costs. Most services on the net (till 1995) were free of charge.	Members are asked to sign a payment statement using a credit card or a direct bank withdrawal. While we have not yet charged members they are all aware of the future "monetary" costs of membership.

Table 3: What the community gives members

Dimensions:	**What typical internet communities give members:**	**What the Lamda community gives members:**
Who helps new members?	Members are expected to install themselves. They are supposed to deal with both the hardware level and the software level.	Once accepted, members gets personal 1-on-1 training. A community trainer will get to there home, install the software and will spend another 2-3 hours showing the new members how to use email, the web, and the community.
Benefits to members (money, respect, credit, etc.)?	Members are usually not paid for their time or efforts.	Members who initiate projects got paid.

The origin of our market driven approach can be traced to the classical dimensions of a community (Hazan, 1988; Shapira and Shavit 1995.). (See Table 4.)

Table 4. **Dimensions of a communities and their ramification with the Lamda community**

Dimensions	How we find them in the Lamda community:
1.Borders	• Metaphor of a map as a physical place. • The notion of members vs. guests. • The feeling of a "club."
2.Symbols	• A logo of the person who is able to lift a house. • Posters of the map, sweatshirts, and other gimmicks. • Definition of language (i.e., a new word "Discussorium")
3.Power	• Give power to those who need and can use it. • Create a parallel support system. • Encourage actions.
4.Time	• Support for a long time. Stability. • Creating a joint culture.

If we follow these dimensions we can see that the simplest way to achieve a sustainable community is to base it on a market driven approach. We do not claim that professional virtual communities should always behave in this market driven way. We simply selected an approach that would match the look and feel of a professional community. This selection seems problematic to typical veteran internet users, especially to those from the academia who were used to the freeness of the net. In the name of "free access to all" we are often perceived as elitists. While this was not the original goal, this very approach proved to be a selling point. Apparently, in the eyes of non-internet users this approach seems natural. This market driven approach have special meaning when it comes to leadership within the community because we actually pay our leaders!

Leadership in the context of the Lamda Project

In January 1996 we presented an initial vision for the community. In this vision (which was presented as a "starting point to be updated as the community develops," we defined the community as a meeting grounds for members. In the opening memo to new members we listed these examples:

- A teacher in Dimona (south of Israel) discusses the question of how can family members help in science teaching with a teacher from Ramat Hasharon (part of the Tel Aviv metropolitan);
- A group of students in Ma'agan Michael exchange information with students in Japan on the effect of salt on the quality of Sushi and Carp;

- Teachers who are interested in creating a teaching program on the subject of Alchemy from a historiosophic point of view consult one another;
- Teacher confer with regional science supervisor on improving the salaries of science teachers;
- A group of teachers in the South send their feedback regarding a new simulation program to the Logal company located in the North;
- Natural science teachers contact the Mabat project regarding their new booklet "The Average River and Its Future";
- The Rehes publishing house consults the users of the book "What is the matter of people - new age biology" on teaching methodologies used in this book;
- Teachers discuss the concept of pay-per-success

At that time we also coined the term "community entrepreneurs." These entrepreneurs would join forces with us (the team) and other members to develop the community and establish it. Again, in the opening message to new members, we demonstrated the meaning of "community entrepreneurs" by suggesting that entrepreneurs can:

- Lead discussion groups (e.g. on the advantages and disadvantages of "science for the gifted" programs);
- Initiate training courses for teaching staff at schools (e.g. a basic course on network uses);
- Initiate network-based teaching materials (e.g. types of flora throughout the country);
- Publish monthly news letters (e.g. on the subject of the science of matter);
- Manage a reaction team (that will provide scientific background for news events);
- Initiate educational programs (e.g. surrounding the Israel Chemical Company Ltd.);
- Translate material on the sciences and science teaching from English to Hebrew.

At the time we did not use the term leaders. Partly by ignorance, partly by design, we felt the term entrepreneurs matched better the needs of the community. As we will later report the issue of leadership became a major factor in the development of the community. While we have no conclusive results we are convinced that we need a better understanding of leadership within virtual professional community

Research Methods

Three types of data feed the research: use data; on-line reflection; and focus groups. They are described next:

Use data

The web allows real-time capturing of member's behavior. Since all members must log on to the site we are able to know who used which service. For example (see Figure 2.) we can see that there is a decline in use at around 8:00pm (possibly due to family time). The numeric data allows us to analyze patterns of use (e.g., novice vs. expert use of the site; the appeal of various services, etc.). Further cross analysis (e.g., kind of member vs. kind of service) allows us to fine tune and adjust the services.

```
hr: #reqs  [Each + represents 40 requests, or part thereof.]
--  -----
 0:  607: ++++++++++++++++
 1:  433: ++++++++++++
 2:  174: +++++
 3:  193: +++++
 4:   74: ++
 5:   89: +++
 6:  160: ++++
 7:  183: +++++
 8:  548: ++++++++++++++
 9:  631: ++++++++++++++++
10: 1042: ++++++++++++++++++++++++++
11: 1686: ++++++++++++++++++++++++++++++++++++++++++++
12: 1415: ++++++++++++++++++++++++++++++++++
13: 1313: +++++++++++++++++++++++++++++++++
14: 1387: +++++++++++++++++++++++++++++++++
15: 1671: ++++++++++++++++++++++++++++++++++++++++++++
16: 1626: +++++++++++++++++++++++++++++++++++++++++++
17: 1168: ++++++++++++++++++++++++++++++
18: 1085: ++++++++++++++++++++++++++++
19:  827: +++++++++++++++++++++
20:  496: ++++++++++++
21:  819: +++++++++++++++++++++
22:  898: ++++++++++++++++++++++++
23:  705: ++++++++++++++++++
```

Figure 2 - Hourly Summary of use in June 1996

The following charts in Figure 3 lists the total numbers of hits per month (upper-left); the total number of hits per day (upper-right) and the distribution of total hits per the hours of the day (bottom).

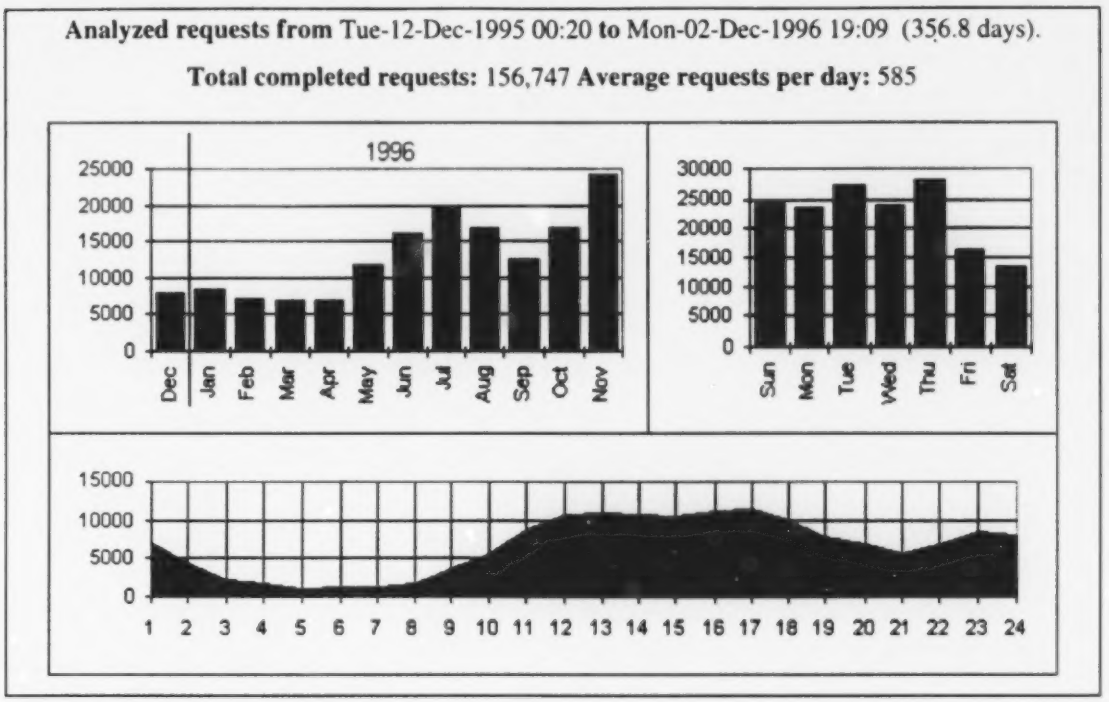

Figure 3: Money, weekly, and hourly distribution of total hits for 11 months.

On-line Reflection

Beyond the quantitative data that we get from the system there is also the automatic capturing of discussions. The main fora for discussion is called the "Discussorium." The Discussorium combines both the capturing of the data (into web pages) and the links to members via e-mail. The qualitative data is stored for future reference and study.

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Figure 4: A typical discussion page.

A typical discussion page (See Figure 4) includes a list of messages. Let's follow line number 12 (marked with the arrow on the right). The line includes an icon for attached files (a Netscape .htm file in this case), the subject, the author, and the date and time of the original message (A click on the subject will lead to the message itself. A click on the author name will open a reply mail window).

Focus Groups

Few times a year we have open house meeting where we meet with members explore the state of the community. Valuable data and ideas are generated in these meetings. The meetings are logged and transcribed for further study.

Results: Patterns of leadership in virtual professional communities

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The continuous stream of data coupled with the need to answer daily needs led to many insights of potential interest to builders of professional virtual communities. Of those insights, we believe that our understandings regarding the patterns of leadership in virtual professional communities are critical to the long term sustainability of such communities.

The original vision of the community was presented in January 1996. Since then it was not developed or re-formulated. The theory was left aside and daily actions began. By December 1996, we had about 200 members and over 9000 pages.

Types of Projects Initiated by the Leaders

Leadership within the community manifests itself in many ways. During the year we captured these leadership acts under the title of projects. We have divided these projects into four groups which as listed in Table 5.

Type of projects (# of projects in 1996)	**Definition:**	**Samples:**
1. Proposed projects. (8)	A proposed project. Most were submitted in a university course I teach called "intro. to the electronic communication in education."	School wide web; a monthly newsletter; more data bases; etc.
2. Start-up projects (10)	Some kind of an activity; may take any shape or form.	A data base of science sites, a mailing list about alternative assessment; a column in the weekly news; a "live" search service, etc.
3. Paid projects (4)	Longer term commitment is needed; or larger investment of time and energy. Payment can be a one time fee or a month payment (in the case of a service).	Evaluating the community; a "cool" site center, a presentation about the community in a conference.
4. Mini-projects (8)	Small turn-key project. Does not demand long term commitment.	Translation of a paper to Hebrew; a document that talks about searching the net; a summary of a talk, etc.

Table 5: Types of projects within the Lamda community

Preliminary Observations about Leadership in Virtual Communities

Here are some preliminary observations concerning those leaders:

- Leaders can learn new things quickly. They are not afraid to ask and demand resources from the team.
- Leaders appear in various ways. They contribute to mailing lists; they organize various new centers; and they bring-in new members.

- Leaders can be divided roughly into two groups: those who want to advance themselves and those who want to advance the community. In the Lamda community these types blend. Furthermore, we have found ourselves pushing for the self-advancing type.
- The idea of professional teachers who advance themselves does not come naturally to teachers. We succeed more with new (and young) teachers than with the veteran (and old) ones.
- At times, leaders in our community lack basic skills of organization and management.
- Longer term leaders are hard to find, shorter term leaders come more easily.
- Leadership takes time; and since teachers chronically lack time they are often prevented from becoming leaders.
- Leaderships of content is relatively easy (collecting data and presenting it); leadership of processes is more difficult.
- Virtual communities allow some people to becomes leaders, and prevent others from becoming one. The virtual world changes the needed entry qualities of leaders.
- Leadership in a virtual community calls for a different mix of leadership qualities.

Discussion

We must admit that currently we lack in our ability to fully analyze the issues of leadership within virtual communities. We lack, because the current leadership theory has not yet developed the concepts when it comes to the virtual world. We also lack, because as the current state of our Lamda community is not yet representative. Let me elaborate on this two claims here.

Leadership science deals with political (including war-time) leadership, idea-based leadership, and corporate leadership. While much can be borrowed from the this research we lack basic experience in virtual leaders. Leadership patterns, at least in the past, took years to develop, and we simply did not have enough years in the virtual world. The virtual world has not yet matured to the level where patterns of leadership have emerged (for a sample of CMC leadership see Perkins and Newman, 1996).

Beyond that this general problem we also have a more local problem. Despite our genuine efforts we were unable to simulate a real world virtual communities. Due to technical difficulties of installing new members, those with previous experience got to fully participate in the community. For example, one of our first leaders was Mrs. Z a very prolific teacher who started up two mini-projects. To our surprise, when her system stopped working she did not push us to re-install her. While she may have dropped even if all the technology performed flawlessly, we will never know if she fulfilled her full potential as a leader in the virtual world.

Of the 40 proposed and implemented projects, four reached the level of paid projects. Apparently it takes longer for a project to justify a "paid project" status (paid status was given to projects that had real value for the community). We may see a surge of "paid projects" early in 1997 when some current mini-projects mature.

Another problem that revealed itself was the basic lack of project management skills. Apparently many members wanted to initiate projects that did not materialize due to lack of experience in managing projects. On the other hand, when we supplied the structure or when the person came with management skills the project took off more easily.

Although these two problems (the lack of leadership theory in virtual communities, and the immature state of our own community) prevents us from suggesting general lessons we can examine the seeds of leadership within virtual communities. In that sense the Lamda community presents a unique opportunity. We will therefore pay special attention in forthcoming year to examining these emerging patterns of leadership.

In conclusion, from the four classical dimensions of communities presented earlier (See Hazan, 1988; Shapira and Shavit 1995), the concept of "power" seems to be tightly linked with leadership. Alvin Toffler (1990) begins his book Powershift, by observing that "despite the bad odor that clings to the very notion of power . . . power itself is neither good nor bad." Since it is "an inescapable aspect of every human relationship," he determines that to "a greater degree than most imagine, we are the products of power" (p.3). Interestingly, he defines power as "purposeful power over people," and concludes that, "in its most naked form, power involves the use of violence, wealth, and knowledge . . . to make people perform in a given way" (p. 14) (argument made by Penner, 1996).

I find the juxtaposition of power and knowledge to be especially relevant when it comes to leadership within virtual communities where skills like communication, vision sharing, and story telling all take a new form.

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